Chapter 9
Measures That Reduce Future-Condition Damage Susceptibility

9-1. Overview

Future-condition damage may be reduced through land-use and construction regulation or by acquisition. Although neither is used commonly in Corps flood damage reduction plans, both are potentially components of a complete plan in which costs are shared with local partners. Consequently, requirements for these measures are described in this chapter. The checklist included in Chapter 8 describes requirements for measures described in this chapter.

9-2. Requirements for Construction and Land-Use Regulation

a. Overview.

(1) Construction and land-use regulation includes building codes, zoning ordinances, and subdivision regulations. These measures decrease future damage by reducing susceptibility of future development.

(2) Figure 9-1 illustrates the result of one form of construction regulation. In this case, the building code requires that the lowest floor of new construction be above the 1 percent chance flood stage. To comply, this structure is built on timber posts. This type of construction, of course, does not control the flood stage, but it does reduce the damage incurred. Construction on concrete walls, on steel, concrete, or masonry posts, piles, or piers, or on earth fill will have similar impact.

(3) Damage susceptibility of new structures can be reduced also by regulating construction materials and practices. Table 9-1 lists typical requirements that may be included in such regulations.

(4) Finally, future damage susceptibility can be reduced with land-use regulations that ensure that future use of floodplains is compatible with the hazard there. Zoning permits district-by-district regulation of "... what uses may be conducted in flood hazard areas, where specific uses may be conducted, and how uses are to be constructed or carried out (USWRC 1971)." Subdivision regulations "... guide division of large parcels of land into smaller lots for the purpose of sale of building developments ... [they] often (a) require installation of adequate drainage facilities, (b) require that location of flood hazard areas be shown on the plat, (c) prohibit encroachment in floodway areas, (d) require filling of a portion of each lot to provide a safe building site at elevation above selected flood heights or provide for open support elevation to achieve the same ends, and (e) require the placement of streets and public utilities above a selected flood protection elevation (USWRC 1971)."

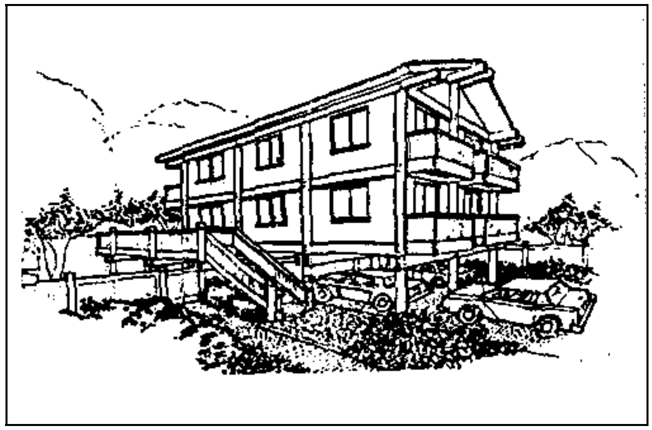

Figure 9-1. Illustration of construction per regulations to reduce damage susceptibility (from U.S. Dept. of Housing and Urban Development 1977)

b. Flood damage reduction assessment: future, with-project evaluation. Paragraph 2-3*b* explains computation of EAD and describes how, if conditions change over time, EAD is to be computed annually and discounted to determine an equivalent annual value over the life of a plan. Land-use and construction regulations will yield changes in the future-condition stage-damage function, thus reducing this equivalent annual value. This is illustrated by Figure 9-2. This figure shows EAD computed over a period of 50 years. Without regulations, the value continues to increase each year as the value of development subject to flood damage increases. If construction and land-use regulations are imposed in 1999, however, the EAD stops increasing. Due to the regulations, the value of property exposed to flood damage does not increase beyond the 1999 level. In fact, if regulations prohibit new construction that is susceptible to flood damage, the EAD may decrease as structures and contents reach the end of their useful life and are replaced with structures and contents less susceptible to flood damage.

c. Technical considerations. To some degree, construction and land-use regulations are applicable in all floodplains. To ensure success, the hydrologic engineering studies are required in delineating the hazard area and characterizing the flooding. The delineation is necessary

Table 9-1
Typical Requirements for New Construction to Reduce Damage Susceptibility (from USACE 1978)

Location	Requirement
Basement	Install drains, valves to equalize water pressure
	Use permeable backfill
	Use water-resistant flooring
	Use moisture tolerant paints and paneling
	Provide ceiling drains to permit drywall drainage
	Provide anchored, water-resistant cabinets
	Construct stairways sufficiently wide for relocation of basement contents
First floor	Use water-resistant paints, paneling, flooring
	Provide cabinets, bookshelves, furnishings that are moisture tolerant
	Provide stairways sufficiently wide for relocation of first-floor contents
Exterior	Anchor tanks to prevent floatation, vent above first floor to prevent fuel escape
	Provide manually operated sewer backflow valves.
	Use nonabsorbent, exterior-grade materials and treated lumber.
Electrical, heating, cooling system	Provide duct drains
	Separate electrical circuits to allow selective shutoff
	Slope gas piping, fit with drains

to identify property to which regulations should apply, and the characterization is necessary to determine the nature of the regulations.

9-3. Requirements for Acquisition

a. Overview. Public acquisition of floodplain property is another method by which the government, either Federal or local, can ensure proper use, thus reducing damage susceptibility. Title to the property can be acquired, or a land-use easement can be acquired. In the first case, ownership of the property shifts to the public, so uses with high risk of damage can be abandoned. Instead, the property can be dedicated to use as a park or wildlife preserve. Acquisition of a land easement leaves property in the hands of private owners, but permits restriction of use. For example, building or filling within an easement can be prohibited.

b. Flood damage reduction assessment: future, with-project evaluation. Acquisition has an impact similar to that of construction and land-use control: It reduces future damage. Figure 9-2 might well illustrate the EAD with acquisition of floodplain property in 1999, as this too will reduce susceptibility to damage, and hence EAD, thereafter.

c. Technical considerations. Again, hydrologic engineering plays a critical role in formulating acquisition plans. The flood-hazard area is delineated to permit identification of land that should be acquired. The change in floodplain development may ultimately alter the hydraulic properties of the channels resulting in the necessity of redefining stage-discharge relationships for the time period following acquisition.

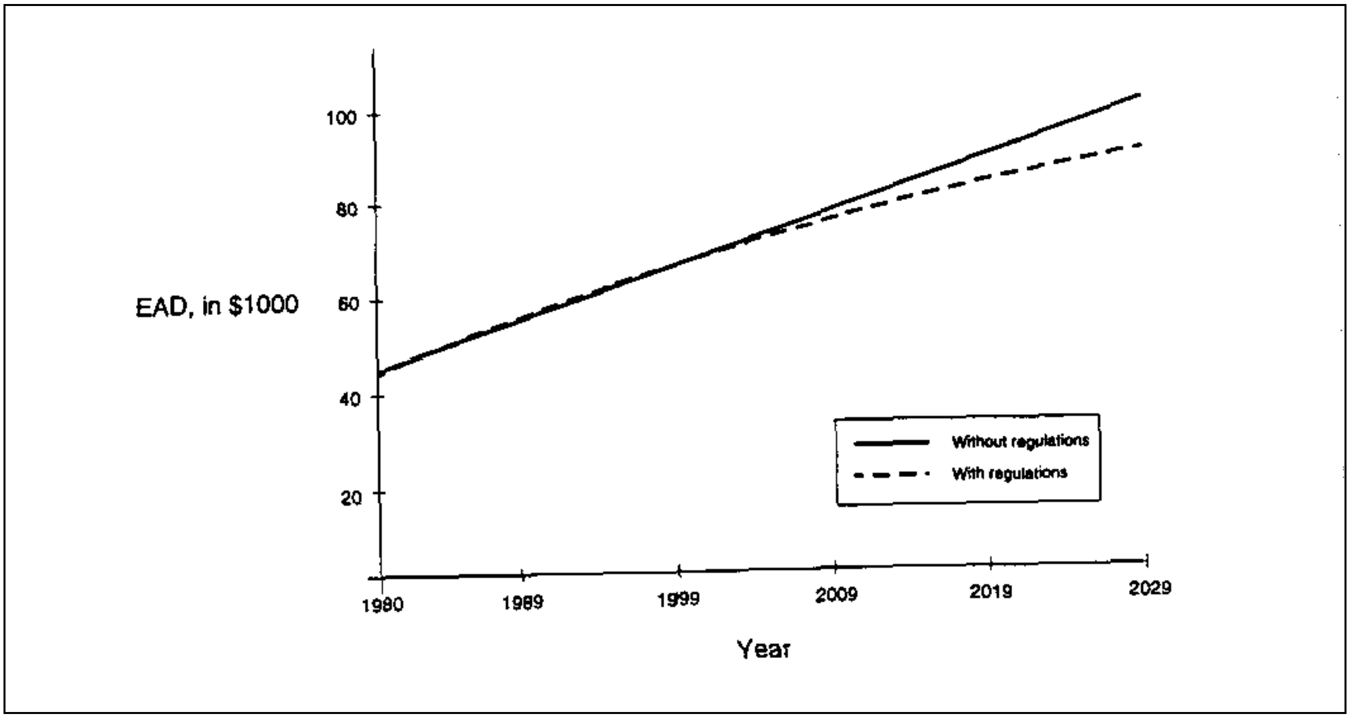

Figure 9-2. Illustration of regulation impact on future-condition EAD